MIN E 408 Mining Enterprise Economics

Winter 2025 - January 06 to April 09

Class time: Monday, Wednesday 9:00-9:50 Location: NRE 1-143

Instructor:

Bo Zhang, PhD, P.Eng, he/him/they

bzhang7@ualberta.ca
DICE 6-239
Office Hours: Book through emails

Course Description:

*3 (fi) (2-0-2) Fundamentals of economic evaluation. Economic evaluation of mining ventures, profitability, risks and uncertainty analyses. Implementation of data-driven decision makings for mine optimization and management strategies. Weekly laboratory/tutorial sessions will explain how to implement advanced data analytics through case studies and specific problems. Weekly laboratory/tutorial sessions will address case studies and specific problems.

Prerequisites: ENG M 310 or 401, and STAT 235

Course synchronous and asynchronous content delivery schedule:

Land Acknowledgment:

The University of Alberta respectfully acknowledges that we are situated on Treaty 6 territory, traditional lands of First Nations and Métis people.

TA Information:

Mr. Walid Ben Saleh (Email: bensaleh@ualberta.ca)

Lab Sections:

Section	Day	Time	Location
LAB H51	Friday	14:00 - 15:50	NREF 2-090

Course Objectives & General Content:

To be able to use basic engineering economic principles and data analytics technique to support mining decisions in the areas of operating cost reporting and management, project evaluation, and asset management.

Learning Outcomes:

By the end of this course, students should be able to:

1. Recognizes mining's impact on the world and Canadian economy and develops and follows a management process that minimizes project impact
2. Be able to evaluate and value a mining operation
3. Recognizes impact of economics on equipment selection and develops and follows a management process that optimizes selection
4. Possess fundamental data analytics techniques, including prediction model, optimization, to inform mining economics and management.

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Assignments (includes labs)			40%
Term Project (Fleet Optimization)			30%
Final Exam			30%

The Faculty recommended grade point average for a 400 level course is 3.1.Instructors have the leeway to deviate from this average and can assign grades based on their own scheme. All grades are approved by the department chair (or delegate). The office of the Dean has final oversight on all grades.

Term Work

All term work solutions will be posted no later than the last day of classes. All term work will be returned to students by the final day of classes, with the exception of major term work due in the last week of classes. The latter will be returned by the day of the final examination or the last day of the examination period if there is no final examination in the course as per university policy; instructors will make accommodations to return these term work. It is the responsibility of the student to pick up all their term work at the specified time and place. Any unreturned term work, shall be retained and then shredded six months after the deadline for reappraisal and grade appeals. Final examinations will be kept for one year as required by university guidelines and the Government of Alberta's Freedom of Information and Protection of Privacy Act.

Calculator Policy

There is no calculator policy in this course; students are free to use the calculator they wish for all assessments.

Expectations for AI use

On the first day of class, we will as a community co-create an agreement identifying expectations on the use of AI tools that ensures everyone: 1) understands the benefits and limitations of the tools, 2) is able to differentiate between appropriate and inappropriate uses, 3) has equal access to such tools, and 4) is clear on the University of Alberta's relevant policies and procedures.
The Community of Learners agreement will align with the University of Alberta's academic integrity policies and procedures (See relevant section on cheating in University of Alberta (November 2022) Code of Student Behaviour). As necessary, we will agree to revisit and reconsider aspects of the agreement throughout the course to ensure all members of the course's Community of Learners continue to have the required shared understanding of the expectations for AI tool use in this class.
Important: Any and all use of AI and AI tools in assessment tasks must be transparently and honestly

identified and referenced as directed. Follow-up reflection assignments explaining AI use must be completed and uploaded to eClass assignments within one (1) day of major assessment task completion.

Text and References (Recommended):

Runge, I., 1998. Mineral Economics and Strategy, SME, Littleton, Colorado.
Gocht, W.R. et al., 1988, International Mineral Economics; (c) by Springer-Verlag, Berlin Heideberg.
Minerals and the economy, Government of Canada.
Data Analytics Applied to the Mining Industry: Soofastaei A. 2021.

Website:

Canvas

Lab Information:

Lab Topic	Date
Lab 1: Lab 1: Cash Flow Analysis	2025-01-24
Lab 2: Lab 2: Time Series Forecasting	2025-01-31
Lab 3: Lab 3: Monte Carlo Simulation	2025-02-07
Lab 4: Lab 4: Review of Python for Data Integration	2025-03-14
Lab 5: Lab 5: ML & Mine Engineering Economics I	2025-03-28
Lab 6: Lab 6: ML & Mine Engineering Economics II	2025-04-04

Did you know that the University of Alberta has various low-to-no-cost services to help students succeed? Visit http://www.deanofstudents.ualberta.ca/ for information about the academic, wellness, and various other support services available to U of A students. It's never too early or too late to seek help!

MIN E 408 – Mine Economics and Analytics
2025 Tentative Schedule (all dates/topics may be subject to change)
Lecture: Mondays and Wednesdays 9:00 to 9:50 am, Room: TBD
Lab: Some of the Fridays (in the table) 2:00 to 3:50 pm, TBD

Week	Date	Topics	Assignments[1]/Labs Due Dates
1	Jan 06 Jan 08 Jan 10	No Class Course Overview and Introduction NO LAB	**Assignment No. 1** – Due Date: January 31, 2025
2	Jan 13 Jan 15 Jan 14	Time Value of Money and Cash Flow Discount Cash Flows NO LAB	
3	Jan 20 Jan 22 Jan 24	Mining Inflation, Escalation & Exchange Rates Mine Cost **Lab No. 1- Cash Flow Analysis**	
4	Jan 27 Jan 29 Jan 31	Canadian Mining Taxation, Financing &Royalty Mining Project Valuation **Lab No. 2 - Time Series Forecasting**	**Assignment No. 2** – Due Date: February 10, 2025
5	Feb 03 Feb 05 Feb 07	Discount rate, Perpetuity and NPV Mining Project Valuation **Lab No. 3 – Monte Carlo Simulation**	
6	Feb 10 Feb 12 Feb 14	Selection of Alternatives Guest lecture by Peter Read, TBD NO LAB	**Assignment No. 3** – Due Date: February 24, 2025
7	**Feb 17-23**	**READING WEEK – NO CLASS – NO LAB**	
8	Feb 24 Feb 26 Feb 28	Replacement/Retention Analysis Risk and Uncertainty in Mining NO LAB	**Assignment No. 4** Due Date: March 17, 2025
9	Mar 03 Mar 05 Mar 07	Risk and Uncertainty in Mining No Class (Mining event) NO LAB (Mining event)	
10	Mar 10 Mar 12 Mar 14	Holiday Digital Transformation in Mining **Lab No. 4 – Review of Python for Data Integration**	**Fleet Optimization Project** – Due Date: March 24, 2025
11	Mar 17 Mar 19 Mar 21	Data Classification, Processing and Integration in Mining Guest lecture by Peter Read, TBD **Lab No. 5 – ML & Engineering Economics I**	
12	Mar 24 Mar 26 Mar 28	Class moved to Apr 4 for Presentation Class moved to Apr 4 for Presentation **Lab No.6 ML & Engineering Economics II**	**Assignment No.5** – Due Date: April 07, 2025
13	Mar 31 Apr 02 Apr 04	Statistical Approach and Predictive Models Data-Driven Decision Makings in Mining **Term Project Presentation (Fleet Optimization)**	
14	Apr 07 Apr 09 Apr 10	Future Skill Requirements in Data-Driven Mining Final Review Final Exam (24 hours)	

The due date for the assignments is 11:30 PM on Canvas.

University and faculty policies

Respect and professionalism

The Faculty of Engineering is committed to fostering and protecting an equitable, inclusive, and respectful work and study environment in line with University of Alberta policies and professional engineering industry standards.

The faculty prepares students to uphold industry standards to become a Professional Engineer (P.Eng). Therefore, respect, professionalism, and accountability must be upheld within the Faculty of Engineering and the University of Alberta.

Academic integrity and student conduct

The University of Alberta is committed to the highest standards of academic integrity and honesty, as well as maintaining a learning environment that fosters the safety, security, and the inherent dignity of each member of the community, ensuring students conduct themselves accordingly. Students are expected to be familiar with the standards of academic honesty and appropriate student conduct, and to uphold the policies of the University in this respect.

Students are particularly urged to familiarize themselves with the provisions of the Student Academic Integrity Policy and the Student Conduct Policy, and avoid any behaviour that could

potentially result in suspicions of academic misconduct (e.g., cheating, plagiarism, misrepresentation of facts, participation in an offence) and non-academic misconduct (e.g., discrimination, harassment, physical assault). Academic and non-academic misconduct are taken very seriously and can result in suspension or expulsion from the University.

All students are expected to consult the Academic Integrity website for clarification on the various academic offences. All forms of academic dishonesty are unacceptable at the University. Unfamiliarity of the rules, procrastination or personal pressures are not acceptable excuses for committing an offence. Listen to your instructor, be a good person, ask for help when you need it, and do your own work -- this will lead you toward a path to success. Any academic integrity concern in this course will be reported to the College of Natural and Applied Sciences. Suspected cases of non-academic misconduct will be reported to the Dean of Students. The College, the Faculty, and the Dean of Students are committed to student rights and responsibilities, and adhere to due process and administrative fairness, as outlined in the Student Academic Integrity Policy and the Student Conduct Policy. Please refer to the policy websites for details on inappropriate behaviours and possible sanctions.

The College of Natural and Applied Sciences (CNAS) has created an Academic Integrity for CNAS Students eClass site. Students can self-enroll and review the various resources provided, including the importance of academic integrity, examples of academic misconduct & possible sanctions, and the academic misconduct & appeal process. Students can also complete assessments to test their knowledge and earn a completion certificate.

"Integrity is doing the right thing, even when no one is watching." -- C.S. Lewis

The Faculty of Engineering expects an environment free of harassment, discrimination, and bullying. We encourage you to talk to the Office of Safe Disclosure and Human Rights about experiences, questions, or concerns. Additional resources and support for students are attached below.

Engineering students studying in the province of Alberta must also follow the Code of Ethics set by the Association of Professional Engineers and Geoscientists of Alberta (APEGA).

Course outline policies, course requirements, evaluation and grading information can be found in the University Calendar.

Safety during learning activities

In all Faculty of Engineering courses, labs, seminars or other learning activities, safety is of paramount importance. In some cases, laboratory work in a program requires high standards for risk management to keep potential hazards safely under control.

Anyone found to be unable to function safely in the class, lab, seminar or other learning activity may be asked to leave or be removed for their and the safety of other participants and instructors in alignment with the Student Academic Integrity Policy and Student Conduct Policy. As members, or prospective members, of the engineering profession, it is your responsibility to identify and inform the proper authorities of unsafe work.

Audio and video recording

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan.

Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Only those items specifically authorized by the instructor may be brought into the exam facility. Students must not bring any unauthorized electronic device into an examination room, including cell phones or other devices.

Student services and support

Health & Wellness Support

Counselling and Clinical Services

Free, short-term, appointment-based counselling and psychiatric services. Also offers drop-in workshops. Book an initial consultation. Visit uab.ca/CCS to learn more.

Wellness Supports Social Workers

Free one-on-one support for students in the areas of housing, finances, academics, personal wellness, life skill development, family dynamics, system navigation, and any area of life where there is a desire to invite change. Visit uab.ca/wellness to learn more.

Sexual Assault Centre

Free, anonymous, and confidential drop-in counselling. Visit uab.ca/UASAC to learn more.

The Office of Safe Disclosure & Human Rights (OSDHR)

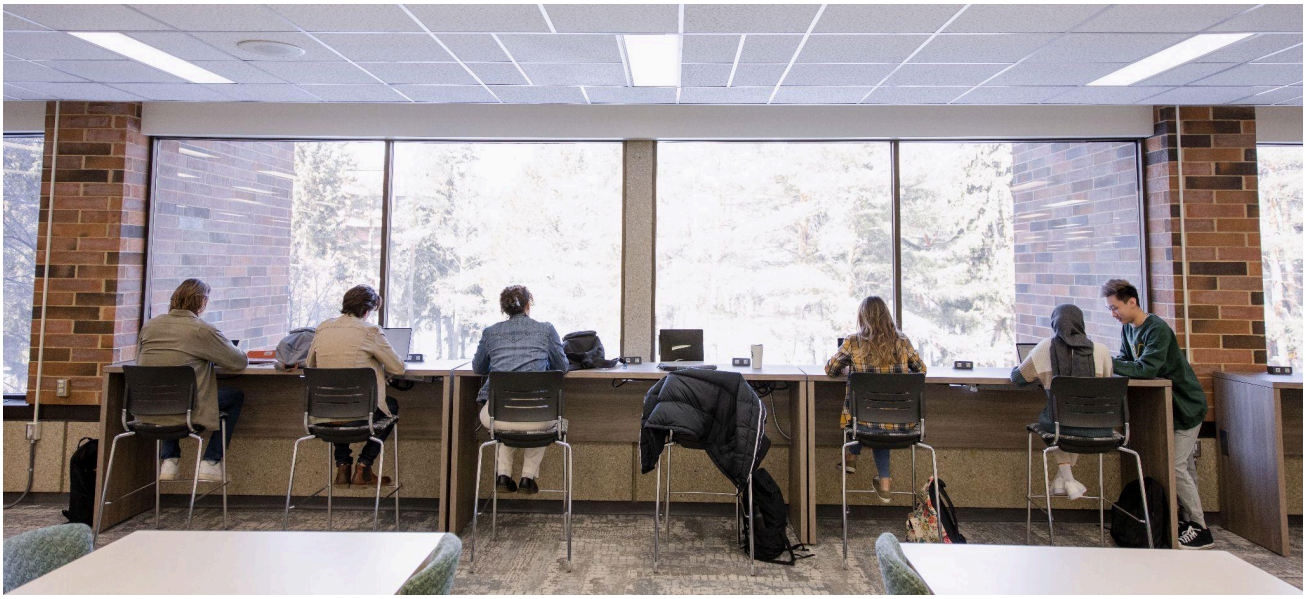
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy. Visit uab.ca/OSDHR to learn more.

HIAR (Helping Individuals at Risk)

If you're worried about someone, contact HIAR, who can help assess risk and connect individuals to support. Learn more at uab.ca/HIAR.

Immediate External Supports

Health Link Alberta: 811
Suicide Crisis Helpline: 988



Academic support

Academic Success Centre
Access to a variety of services to maximize your academic success. Learn more at uab.ca/ASC.

Accessibility Resources
Connects students with disabilities to accommodations. Learn more at uab.ca/Access under accommodations + accessibility.

Decima Robinson Support Centre
Academic support for 100- or 200-level introductory calculus, linear algebra and statistics courses. Visit uab.ca/DSC to learn more.

Engineering Student Success Centre
The Faculty of Engineering provides drop-in tutoring for first-year courses. Visit uab.ca/ESSC to learn more.

Office of the Student Ombuds
Call for complex problems and conflict mediation. Learn more at uab.ca/ombuds.

UNIVERSITY OF ALBERTA

Financial support

Student Service Centre

For awards and other funding support. Learn more at uab.ca/ask.

Campus Food Bank

The Campus Food Bank Society is an independent charity supporting University of Alberta students, faculty, staff, and alumni for up to five years. For additional information visit their website at campusfoodbank.com.